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ABSTRACT

Three explanations for post-stress performance decrement were investigated--learned helplessness, passive uncontrollability, and distrust. A group of male and female undergraduates at Carthage College (N=112) were exposed to one of four stress treatment conditions: escapable noise (EN), inescapable noise (IN), noise experienced with no expectation of control (NC) or no noise (NN). Three measures of subsequent performance decrement on an anagram task were obtained: trials to criterion, mean solution time, and total failures to solve. To test for distrust, this task was administered by the same or a different experimenter. A three-way analysis of variance was performed for stress treatment, same versus different experimenter, and sex of subject. A significant main effect for stress treatment was found. The IN and NC groups showed equivalent performance decrements on all three dependent variables. The EN and NN groups showed no performance decrements. No other significant main effects or interactions were found. Experiencing uncontrollability resulted in equal performance decrements regardless of subjects' expectations of or efforts to control the noise. Distrust was not supported as an alternative explanation. (Author)

Performance Decrements Following Stress: Learned Helplessness, Passive Uncontrollability, or Distrust?

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The need to control one's environment can be seen in a broad range of human behavior, from the toddler who constantly gets into everything within reach to the adult who keeps abreast of local issues so he can intelligently present himself to others. White (1959), for example, labels this need for control effectance and considers it central to human motivation. Phenomenologically, the experience of control involves perceiving the connection between behavior and outcomes. Thus, if a person is placed in a situation where he perceives no connection between behavior and outcomes for an extended period of time, he or she may experience a reduction in motivation which may result in impaired performance on future tasks. Seligman and others (Maier and Seligman, 1976; Seligman, 1976; and Hiroto and Seligman, 1975) have demonstrated that the experience of prolonged uncontrollability may result in such performance devrements. This finding has been labeled "learned helplessness" and has been described by Hiroto (1974) as a phenomenon in which learning of independence between response and outcome interferes with future responding. Learned helplessness was first demonstrated by Overmier and Seligman (1967). Dogs that had experienced inescapable shock subsequently failed to learn to escape or avoid shock in a new situation where escape was possible.

According to Maier and Seligman (1976) the learned helplessness effect seems rather general among species that learn. In research with animals, learned helplessness procedures have reliably and consistently produced subsequent performance decrements in a number of species including dogs

(Overmaier and Seligman, 1967), cats (Thomas and Balter, in press), rats (Maier, Albin, and Testa, 1973), and goldfish (Padilla, et al., 1970). In such procedures, helplessness has usually been produced by exposure to inescapable electric shock varying in frequency, duration, and/or temporal pattern.

Use of the learned helplessness paradigm with humans has yielded not only inconsistent but sometimes paradoxical results. On one hand, many studies have successfully demonstrated learned helplessness results with humans (e.g., Fosco and Geer, 1971; Hiroto, 1974; Hiroto and Seligman, 1975). On the other hand, some studies have found results inconsistent with the learned helplessness hypothesis. For example, Thornton and Jacobs (1971) found that subjects having perceived control over shock performed better on cognitive tasks during exposure to stress than subjects exposed to uncontrollable shock. Surprisingly however, subjects with no control over shock performed no differently than subjects not exposed to shock, contrary to the learned helplessness prediction. Roth and Bootzin (1974) found that subjects exposed to uncontrollable stress subsequently exhibited more controlling behavior in a testing situation than subjects who had no previous experience with uncontrollability, also contrary to the learned helplessness prediction. The inconsistencies in findings such as these may be due simply to procedural differences. However, they also pose a sufficient challenge to the generality of the learned helplessness phenomenon in humans that a closer look at the nature of the learned helplessness experience is warranted.

The inconsistencies in the procedures of the different studies that have investigated learned helplessness make comparison among the studies and accurate definitions of the nature of the learned helplessness effect difficult. Exposure to uncontrollable outcomes has been defined in two very different

ways: subjects in the uncontrollable stress group in some experiments (e.g., Hiroto, 1974; Hiroto and Seligman, 1975) have been given an expectation of control over aversive stimulation, while subjects in supposedly analogous groups in other studies (e.g., Thornton and Jacobs, 1971; Sherrod and Downs, 1974) have been explicitly informed that they will be unable to control the stressor. Also, some studies have used a group experiencing the latter as a control group, while others have used a group experiencing no stressor. The present study seeks to resolve some of these inconsistencies by including all three of the aforementioned groups.

Another purpose of this study is to investigate the effects of experiencing uncontrollability when subjects have no expectation of and make no active attempts to control the stressor. Glass and Singer (1972) exposed subjects to a noise stressor during performance of an unrelated task and found impaired postnoise performance as a function of lack of actual or perceived control over noise occurrence. Although this experience of uncontrollability is separate from the learned independence between response and outcome resulting from the experience of trying and failing to exert control, both result in impaired performance. There may be a difference, however, in the degree to which each situation produces such decrements. While one group experiences a lack of control, the other is presented with the experience of failure in addition to uncontrollability.

Another factor perhaps contributing to the performance decrements exhibited by subjects who have been exposed to uncontrollable outcomes is distrust of the experimenter. A subject's inability to exert control over a situation may cast serious doubt on the experimenter's credibility. If the subject who has been placed in such a situation is then either asked to contin th the same task (Fosco and Geer, 1971), or is given a task that is highly

similar (Thornton and Jacobs, 1971), or a task administered in the same room (Hiroto, 1974), by the same experimenter (Thornton and Jacobs, 1971), or both (Hiroto and Seligman, 1975) his or her perception of the second situation as uncontrollable may be due to suspicion of the experimenter rather than to a feeling that he or she is incapable of control. This distrust explanation has been advanced but not tested by Wortman and Brehm (1975) and Tennen and Eller (1977). The present study tests this explanation by presenting the test task as a separate experiment being run by either the same or a different experimenter.

In addition to investigating the distrust issue presented above, the purpose of the present study was to test the hypothesis that the experience of repeated failure to control aversive noise will cause more of a performance decrement than passive exposure to noise experienced with no expectation of control, and that exposure to both of these forms of uncontrollable noise will produce greater performance decrements than exposure to controllable noise.

Method

Subjects

Subjects were 126 general psychology students at Carthage College who participated in partial fulfillment of course requirements. Subjects signed up for time slots which were convenient for them and were assigned to groups on that basis. In all, the data of fourteen subjects was discarded: ten subjects in the escapable condition failed to solve the problem, three were randomly eliminated to create equal N, and one was eliminated because the experimenter violated standard procedure. Of the 112 subjects whose data were used, 56 were males and 56 were females.

Apparata

A rectangular metal box with a front surface of 7"x 10" containing a button switch and three indicator lights was used for the instrumental task

during which the independent variable was manipulated. The noise stressor was presented by a Sonalert electronic signal (Mallory-SC628, 2900 Hz) at 28 VDC. Anagrams used to measure the dependent variables during the post-test were presented on 3"x 5" cards with ¼" lettering.

Procedure

Subjects were initially assigned to one of four treatment groups; escapable noise (EN), inescapable noise ($\overline{EN}$), noise control (NC), and no-noise control ($\overline{NC}$). Following the treatment, all groups performed a cognitive (anagram) test task for helplessness, patterned after Hiroto (1974). For half of the subjects in each group, both tasks were administered by the same experimenter, while for the other half each task was presented by a different experimenter. The test task was presented in an adjacent room. In all groups sex of experimenter was counterbalanced, and in the different experimenter groups, order of experimenter was also counterbalanced.

Treatment. Subjects in the escapable noise treatment group experienced 50 trials of aversive noise. The noise could be terminated on any trial by four consecutive button presses, but subjects were requested to try to turn off the noise only on those trials specified by a light marked "try". The purpose of the try light was to give subjects in the EN group the experience of control without actually having them terminate the noise on each trial. In pretesting without the try light subjects in the EN group quickly discovered and applied the pattern to turn off the noise each time it occurred. Consequently, without the try light, the yoked $\overline{EN}$ group would have experienced a few long noise bursts at first, followed by a long series of bursts so short as to preclude any earnest attempts to terminate them. The addition of the try light, by increasing the duration of most of the noise bursts, thus gave the $\overline{EN}$ group sufficient time to attempt to turn off the noise and strengthened the experience of failure to exert control. The try light was turned on a

total of ten times, averaging once every five trials. If the subject terminated the noise a light marked "success" came on. A light marked "T-Out" for time-out signaled the end of the trial both when the subject failed to terminate the noise and when no attempts were made (i.e., when the try light was not on). Use of the "T-Out" label avoided the connotation of failure on those trials when the subject made no active attempt to control the noise.

Subjects in the inescapable noise group were yoked and thus experienced the same pattern of aversive noise as those in the escapable noise group. The noise could not be terminated on any trial. However, subjects were informed that there was a way to terminate the noise and were asked to try on each trial. The try light remained on throughout the task. The function of the other two lights was the same as for the EN group except that the label "Failure" was substituted for "T-Out".

Subjects in the noise control group also listened to the same pattern of noise as the escapable noise group. However, subjects were given no expectation of control over the noise and were simply instructed to press the button once on those trials when the try light flashed on. The "Success" label was removed and only the light marked "T-Out" was used for this group, signaling the end of the trial.

Subjects in the no-noise control group were asked to react, by pressing the button once, only to the onset of the try light. The other lights were neither used nor labeled. Subjects experienced no aversive noise. In order to control for button pressing both control groups were informed that they were participating in a reaction time experiment.

Subjects in the EN, $\overline{EN}$, and NC groups were all informed that they would be listening to noise and were given the opportunity to leave after exposure to a brief sample. However, no subjects chose this option. The functions

of the "Success" and "Failure/T-Out" lights were explained using instructions based on Hiroto and Seligman (1975).

If a subject in the EN group failed to terminate the noise, it lasted for 5 sec. The onset of the "Failure/T-Out" light corresponded to the end of the 5 sec. interval. The onset of the "Success" light corresponded to the subject's termination of the noise. The intertrial interval ranged from 10 to 21 sec. with a mean of 15.65 sec. The NC and EN groups were yoked with the EN group so that subjects in all three conditions experienced the same amount and pattern of noise.

Dependent Measures. An anagram task was used for all groups to assess performance decrement. All subjects were presented with 20 solvable, five letter anagrams, each having the same letter pattern (52413). The anagrams could be solved individually but the easiest method was to learn to use the letter sequence. Subjects were informed that there might be a pattern by which to solve the anagrams, but that it was up to them to figure it out. A maximum of 100 sec. was allowed for each anagram. Instructions for this task were also based on Hiroto and Seligman (1975).

Results

In all, three dependent measures were obtained for each subject: a) trials to criterion for anagram solution, (criterion defined as four consecutive solution times of less than ten seconds); b) number of failures to solve, defined as the number of trials with latencies of 100 sec., the point at which the trial ended; and c) mean response latency for the 20 anagrams. A three-way analysis of variance was performed for each dependent variable with the three factors being treatment condition, same vs. different experimenter, and sex of subject.

Insert Table 1 about here

A significant main effect for treatment groups, supportive of the learned helplessness prediction, was found ($p < .05$) for all three dependent variables. Table 1 shows that for the two groups which had no control over the stressor ($\overline{EN}$, NC). mean solution time, number of trials to criterion, and the number of failures to solve were all greater than in the other two groups ($\overline{EN}$, NC). Further, subjects who did have control over the stressor (EN) showed no performance decrement on any of the dependent variables compared to the no stress control group ($\overline{NC}$). The pattern of group means remained constant for all of the dependent variables. Neither the same vs. different experimenter nor sex of subject main effects were significant, and no significant interactions were found.

Insert Table 2 about here

Discussion

It was predicted that failure to control aversive noise would result in a greater performance decrement than exposure to noise experienced with no expectation of control and that both of these forms of uncontrollable noise would produce greater performance decrements than controllable noise. Our results support only the latter part of this hypothesis. In fact, failure to control aversive noise and noise presented with no expectation of control resulted in equivalent performance decrements which were consistently greater than those following exposure to controllable aversive noise. In other words, performance decrements were found only in those two conditions when subjects had no control over aversive stimulation.

Controllability/uncontrollability thus appears to be the key factor in determining the stressor's aftereffects. Whether subjects actively attempted to exercise control and failed, as in our EN group and Seligman's (1975) research, or simply tolerated stress during performance of an unrelated task, neither expecting nor attempting control, as in our NC group and Glass and Singer's (1972) work, subsequent performance was similarly impaired. The learned helplessness paradigm cannot account for the equivalent performance of the EN and NC groups because the NC group, having neither the expectation of nor the opportunity to control, had less reason to conclude that responding and outcomes were unconnected. The common factor then, despite differences between groups, is that neither group experienced control. Just as lack of control resulted in negative aftereffects in the EN and NC groups, the control over the stressor exercised by the EN group appeared to prevent similar performance decrements. The fact that the performance in the EN group was equivalent to the NC group strongly supports the mediating effect of control over unpredictable stress.

Distrust did not appear to affect subject performance in this experimental situation, since the same vs. different experimenter manipulation did not yield a significant main effect and did not interact significantly with any other variable. However, the concept of experimenter distrust should not be ruled out completely, as there were factors in the present study that may have reduced the effects of a different experimenter. Perhaps the most evident factor was the subject's familiarity with the experimenters. This familiarity may have resulted in some degree of trust of the experimenter prior to the experiment. A second factor was the strength of the same vs. different experimenter manipulation. The two presumably different experiments were conducted in two adjacent rooms within the same laboratory.

Had the perception of two separate studies been enhanced by presenting the tasks in more clearly differentiated locations, the distrust hypothesis would have been tested in a more convincing manner.

In summary, the present study demonstrates the importance of control or lack of control in determining the consequences of exposure to an aversive stimulus. The experience of uncontrollability resulted in equal performance decrements regardless of subject's expectations of or efforts to control the noise. Distrust was not supported as an alternative explanation for "learned helplessness" effects.

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Table 1

Summary of Group Means for Stress Treatment Conditions

Group	Solution Time (in seconds)	Trials to Criterion	No. of Failures to Solve
EN	28.55	12.39	3.29
$\overline{EN}$	45.42	17.11	5.93
NC	42.39	15.46	5.71
$\overline{NC}$	31.82	14.46	3.36

Table 2

Summary of F-Values for Dependent Measures

	Solution Time	Trials to Criterion	No. of Failures
Experimenter (A)	1.77	<1	1.81
Treatment (B)	3.10*	2.86*	2.90*
A x B	<1	<1	<1
Sex (C)	<1	3.49+	<1
A x C	<1	2.16	<1
B x C	1.03	<1	1.15
A x B x C	<1	<1	<1

*$p < .05$

+$p < .07$